Space Weather Forecast

Issued on Saturday, 02 September 2023 at 01:31 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 Moderate storms likely 02-03 Sep due to Coronal Mass Ejection arrivals. Chance of Moderate flares (R1-R2 Radio Blackout) 02 Sep, decreasing 03 Sep onward.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with a long duration Moderate flare from the largest and most complex region on the disc. This is approaching the northwest limb, so is becoming increasingly hard to assess however, it appears to have maintained some complexity after the flare. Of the other sunspots there is one in the southeast which has some limited complexity, and a further small bipolar region in the southwest. There are two further small unipolar spots, while a small region has recently emerged in the northwest, to give six sunspots in total.

The Moderate flare produced a moderately fast Coronal Mass Ejection, but with the bulk of the material mainly directed north and ahead of Earth. However, arrival is anticipated around 03/0600 UTC. A further CME was also observed due to a small eruption from the sunspot on the southwest disc at 01/0620 UTC. This has been analysed as a slower and weaker CME, largely passing ahead and south of Earth, but with a chance of a glancing impact 03 Sep.

Solar Wind / Geomagnetic Activity: Ongoing fast wind influence was observed, with a likely transition into the main core of winds from a coronal hole occurring. Solar wind speeds were initially slightly elevated at 400-450 km/s, but fairly rapidly increased between 01/1750-1830 UTC to be 500-600km/s. The total Interplanetary Magnetic Field (IMF) persisted Weak to Moderate, with the north-south direction remaining variable. Phi angle persisted positive (away from the Sun). Geomagnetic activity was Quiet to Active (Kp 1-4, with the Kp4 interval 01/1200-1500 UTC).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) rose from background levels to S1 Minor Radiation Storm shortly after 01/0400 UTC due to the Moderate flare, peaking around 01/0600 UTC. These eased below the S1 level from around 01/2000 UTC, but remained above background levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to Low activity day 1 (02 Sep), with a further risk of Moderate flares from the northwest sunspot. This activity is expected to ease day 2 (03 Sep) onward, as this rotates over the northwest horizon, with the other spots on the disc currently smaller and simpler.

Solar Wind / Geomagnetic Activity: There are two main CMEs, and a further small glance possible in the forecast. The first is expected to arrive 02/2200 UTC +/- 9hours and is from 30 Sep. The second is expected to arrive 03/0600 +/- 9hours, and is from the moderately fast CME which occurred alongside the Moderate flare on 01 Sep. A further small glance is possible on day 3 (3 Sep) from the further small CME which left the Sun 0600 on 01 Sep. Otherwise, current fast wind is expected to ease day 1 (02 Sep), with CME conditions then dominating, albeit easing day 3 and day 4 (04-05 Sep). The next coronal hole fast wind enhancement is then possible late on day 4. Any early Active to G1 intervals due to onset of fast winds easing day 1,

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before CME arrivals bring an increasing likelihood of a period of G1-G2/Minor to Moderate storms, most likely day 2 (03 Sep), but with an ongoing chance of G1 Minor storms day 3 (04 Sep). There is a slight chance of G3 Strong Storms, mainly day 2. Activity then easing to be mainly Quiet to Unsettled by day 4.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to slowly decline towards background levels however, further Minor Storms are possible, mostly in the next two days.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	70	30	10
Strong	G3	No	5	20	10	1
Severe	G4	No	1	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	55	40	30	30
Very Active	R3 to R5 X	No	5	2	1	1

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	Yes	15	10	2	2
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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